

solve the problem of the origin of the immense quantities of protoplasm that form a bottom to the sea, but is disinclined to regard it as consisting of the mycelium of sponges, an opinion advanced by Wyville Thomson. He finds the well-known yellow cells of Radiolaria to contain starch, the reactions of which are not distinguishable from those characteristic of starch derived from vegetables. These starch granules make up more than half of the entire mass of the Radiolaria.

The *Bulletin de la Société Impériale des Naturalistes de Moscou*, 1869, No. 2 (received June 15, 1870), contains, amongst other valuable papers, a carefully-worked-up description of the anatomy and development of the *Pedicellina*, by B. Uljanin, which is accompanied by two plates illustrating the changes undergone as far as he had an opportunity of observing them.

In the last number (Heft iv. Band ix.) of the *Sitzungsberichte der K. Akad. der Wissenschaften zu Wien* is a long paper by Dr. A. Polotebnow on the origin and mode of increase of Bacteria. These, as most of our readers are aware, consist of very small rods, which present a kind of transverse striation at tolerably regular intervals, like an extremely diminutive sugar-cane of from two to six or seven joints, and which exhibit irregular vibratory movements. They have been, like other lowly organised forms, sometimes considered, as by Dujardin, to belong to the animal kingdom; sometimes, as by Cohn, to represent a form of vegetable life; and sometimes, as by Pertz, to occupy an intermediate position on the confines of the two kingdoms. Dr. Polotebnow finds that an unbroken series of forms can be observed between the minute round cells which form the mycelium of *Penicillium*, and probably other fungi, and fully-developed Bacteria. In regard to their multiplication, he thinks this can only occur from the cells above mentioned, and that when they have once become fully formed Bacteria they are no longer capable of further multiplication.

## SOCIETIES AND ACADEMIES

LONDON

Geological Society, June 8.—Mr. Joseph Prestwich, F.R.S. president, in the chair.

Mr. Henry G. Vennor, of the Geological Survey of Canada, Montreal; Alexander Kendall Mackinnon, Memb. Inst. C.E., Director-General of Public Works, Montevideo, South America; and Mr. Arthur Roope Hunt, Quintella, Torquay, were elected Fellows of the Society.

1. "On the Superficial Deposits of the South of Hampshire, and the Isle of Wight." By Thomas Codrington, F.G.S. This paper treated of the gravel deposits covering the tertiary strata of the country between Portsmouth and Poole, and of the Isle of Wight. The strikingly tabular character of the surface is best seen on the east of the Avon, where from the coast for more than twenty miles inland a gravel-covered plain can be followed, rising gradually from 80 feet to 420 feet above the sea, at the rate of about 20 feet per mile. The high plains of the New Forest, to the eye perfectly level, and indented by deep valleys, are portions of this table-land. The plateau between the Bournemouth Cliffs and the Valley of the Stour, and detached gravel-capped hills further inland, are the remnants of a similar table-land on the west of the Avon, while eastwards the same character prevails up to Southampton Water. Sections parallel with the coast show the level nature of the country, broken only by well-defined river-valleys. On the east of Southampton water a similar tabular surface, sloping at a steeper angle towards the shore-line, and cut through by the valleys of the Itchen, Hamble, and Titchfield rivers, remains; and in the Isle of Wight the gravels capping the flat-topped tertiary hills coincide with a corresponding plain sloping northwards. The gravel covering these table-lands is composed chiefly of subangular chalk-flints, with a varying proportion of tertiary pebbles. Sarsen stone blocks are found everywhere, and on Poole Heath granitic pebbles; and in the gravel of Portsea large boulders of granitic and palæozoic rocks are met with. In the Isle of Wight, chert from the Upper Greensand, and materials from the Lower Cretaceous beds also occur. The colour of the gravel is generally red; and the origin of the white gravel, which often overlies the red, is to be ascribed to the bleaching action of vegetable matter. Brick-earth is generally associated with the gravel at all levels but the highest; but the contorted appearances attributed to glacial action only occur at low levels. No organic remains have been found in the gravel

covering the plains, while the valley-gravels of the district have afforded mammalian bones and teeth of the usual species. Flint implements have been found at Bournemouth at 120 feet above the sea; at Lymington, near Southampton, at 80 and 150 feet; and also along the shore between Southampton Water and Gosport, at 35 feet above the sea, from gravel forming part of the covering of the tabular surface, and unconnected with the river valleys. The gravel capping the cliffs of the south coast of the Isle of Wight, in which the remains of *Elephas primigenius* have been found near Brook and Grange, was probably deposited in the same river-basin as the mammaliferous gravel of Freshwater; and the cutting back of the coast-line by the sea has given the tributaries of a river which flowed by Freshwater northwards to the Solent, a direct outfall to the sea; and the streams thus intercepted at a high level, under the changed condition of flow, have originated the *Chines*. The gravel cliff of the Foreland, at the eastern end of the Isle of Wight, consists principally of raised shingle, which towards the south thins out, and is overlain by a thick deposit of brick-earth, a continuation of which caps the cliffs up to the chalk, and in which a flint implement was found by the author at 85 feet above the sea.

*General Considerations.*—The marine gravel, with granite boulders covering the south of Sussex, is continued westward by the gravel with similar boulders covering Portsea Island; and this again by the Hill-head gravels, with large blocks of Sarsen stone, these lower gravels being bordered on the south by the raised shingle deposits of the Isle of Wight, and on the north by the higher marine gravels of Avisford, Waterbeach, and Bourne, from which the lower gravel is divided by a well-marked step, extending beyond Portsdown Hill to Titchfield, and traceable on the west of Southampton Water. The Hill-head gravels are considered to be an estuarine deposit, of the same age as the marine gravels of Sussex, and the low-level gravels of the river-valleys; they are supposed to have been formed when the Isle of Wight was still joined to the main land, and all the rivers now reaching the sea by Poole Harbour, Christchurch Harbour, Southampton Water, &c., were affluents of a river communicating with an estuary opening to the sea in the direction of Spithead. The gravels lying above the step, such as those of Avisford and Waterbeach, Titchfield Common, Beaulieu Heath, and Bournemouth, are looked upon as equivalent in position and age to the high-level valley gravels. The level of the gravels on the highest parts of the table-lands is such as to indicate an age far greater than that of the highest gravels of the river-valleys; but the uniform surface from the 400-foot level downwards points to a long continuance of similar conditions, during which the gravel from the highest levels to that of the Bournemouth Cliffs was deposited. The area that can with any probability be assigned to the catchment basin of a river such as that which has been before alluded to, is only three-quarters of the basin of the Thames above Hampton, within which it is difficult to imagine that such an extent of gravel could have been spread out; and the inclination of the flattest of the table-lands is for a river such as only mountain-streams have, and quite incompatible with the spreading out of large even surfaces more than twenty miles across. It is considered more probable that the materials of the gravel were brought down from the chalk country on all sides by rivers, and spread out in an inlet of the sea shut in on the south, and opening out eastwards. This view is not without difficulties; it involves a gradual upheaval of the land, which, when the highest gravels now remaining were being spread out at or near the sea-level, must have stood more than 400 feet lower; and a considerable part of this upheaval must have taken place since the formation of the gravel in which implements fashioned by man are imbedded.

2. "On the relative position of the Forest-bed and the Chillesford Clay in Norfolk and Suffolk, and on the real position of the Forest-bed." By the Rev. John Gunn, M.A., F.G.S.

The author commenced by stating that both at Easton Barent and at Kessingland the Forest-bed is to be seen forming part of the beach, or of the foot of the cliff, and underlying the Chillesford Clay. He considered that the soil of the Forest-bed had been deposited in an estuary, and that after its elevation the trees, of which the stools are now visible along the coast, grew upon it, and the true Forest-bed was formed. After the submergence of this first freshwater, then fluvio-marine, and finally marine deposits were formed upon it; and the author proposed to give the whole of these deposits the name of the "Forest-bed

series." The author suggested that the Forest-bed itself is represented inland by the stony bed which lies immediately upon the chalk and between it and the Fluvio-marine and Marine Crags, his theory being that the surface of the chalk, after supporting a forest-bed fauna, was gradually covered up by successive crag deposits.

3. "On *Proterosaurus speneri*, von Meyer, and a new species, *Proterosaurus huxleyi*, from the Marl-slate of Midderidge, Durham." By Albany Hancock, F.L.S., and Richard Howse. Communicated by Prof. Huxley, F.R.S., F.G.S.

In this paper the authors described a specimen which they referred to *Proterosaurus speneri*, von Meyer; and one of a smaller form, which they regarded as new, and described as *Proterosaurus huxleyi*. Both were from the same part of the marl-slate of Midderidge, Durham. The two species agree in having the limbs and tail long and the neck long, and composed of seven vertebrae, in the number of dorsal vertebrae, in the number and character of the bones of the hand, and in some other particulars, sufficient, with these, in the opinion of the authors, to justify the reference of both to the genus *Proterosaurus*. In *P. huxleyi* the ribs are flattened instead of rounded at the proximal extremity, and less widened and grooved at the distal extremity than in *P. speneri*; the hind limb is considerably longer in proportion to the fore limb; and the distal extremity of the humerus is only twice as wide as the constricted part, instead of three times, as in the old species.

Chemical Society, June 16.—Prof. Williamson, F.R.S., president, in the chair. L. A. Lucas and A. W. Bickerton were elected Fellows. Mr. James Bell read a paper on "Fermentation." The author has instituted a series of experiments to determine: 1. The forms of natural ferment which various albuminous bodies will give rise to in solutions of cane sugar, and of cane sugar and glucose. 2. The relative fermentative powers of various ferments, especially of those occurring in malt extract and in the grape juice. 3. The influence of change of soil upon the fermentative organisms. From among the manifold results obtained in these experiments, the following may be mentioned: (a) Addition of glucose to fermenting liquids, especially to the juice of grape, is advantageous, inasmuch as it assists to exhaust the juice of its fermentative element, and thus imparts to the wine a greater keeping power. (b) Each ferment has its favourite soil. The President, in proposing a vote of thanks to the author, took occasion to give a brief *résumé* of the present state of knowledge of the yeast plant. Though called a "plant," the yeast organism appears in all its functions rather animal than vegetable; the products of its secretion are less complicated than those it takes in; it does not, like plants, require light for its vital process, neither does it absorb heat, but on the contrary gives it off. Alluding, then, to Liebig's recent memoir on fermentation, Prof. Williamson observed that that distinguished chemist had entirely dropped his former notions regarding the process of fermentation.—Dr. Heisch communicated a paper "On organic matter in water." The author was some time ago called on to assist a large manufacturer of lemonade, who suddenly found it impossible to make lemonade that would keep. After a day or two it became turbid, and its odour anything but agreeable. On investigating the liquid under the microscope it was found full of small spherical cells with, in most cases, a very bright nucleus. After examining all the materials employed, the fault was detected to be with the water. On putting a few grains of pure crystalline sugar into some of the water, it became turbid in a few hours, and contained the cells above mentioned. On inquiry it turned out that the well from which the water used in the preparation of the lemonade was obtained, had been slightly contaminated with sewage. This led the experimenter to mix a minute quantity of sewage with a sugar solution; the cells very soon made their appearance. Filtration through the finest Swedish paper does not remove the germs. Boiling for half an hour in no way destroys their vitality. Filtration through a good bed of animal charcoal seems to be the only effectual mode of removing them, but it is necessary to air the charcoal from time to time, else it loses its purifying property.—Mr. Perkins read a letter from Prof. Strecker, wherein the latter claims the priority of having published the true formula of alizarin as early as 1866, a fact which was not mentioned by Mr. Perkin in his recent lecture on alizarin. Mr. Perkin said that this omission was due to an oversight on his part, certainly not to any intention to deprive Professor Strecker of his merits.—Mr. Herman read a paper "On the methods for the determination of carbon in steel." Several samples of steel were analysed according to different

methods, with the view of ascertaining which of the usual processes for determining the carbon in iron is the most advantageous. A large number of careful experiments led to the conclusion that the direct burning of the iron filings in a stream of oxygen (Wöhler's process) is the most expeditious and accurate method. In the following table the means of the results obtained by the different methods are given, the quantities of ferric oxide obtained by combustion in oxygen are almost identical with those required by theory.

|                         | I.     | II.   | III. | IV.   | V.    | VI.   | VII. | VIII. |
|-------------------------|--------|-------|------|-------|-------|-------|------|-------|
| By Eggertz's method     | 1'319  | '789  | '701 | '587  | '486  | '349  | '283 |       |
| By combustion in oxygen | 1'1656 | '7602 | '635 |       |       | '3594 | '273 | '9215 |
| By Elliott's method     | 1'248  | '8065 | '724 | '6701 | '5025 | '4772 | '349 | '9427 |

## PARIS

Academy of Sciences, June 13.—The following mathematical papers were read:—Demonstration of Jacobi's method for the formation of the period of a primitive root, by M. V. A. Le Besque; on the construction of the axis of curvature of the developable surface, enveloping a plane of which the displacement is subjected to certain conditions, by M. A. Mannheim, communicated by M. Chasles; and on a certain family of curves and surfaces, by MM. F. Klein and S. Lie, also presented by M. Chasles.—MM. Jamin and Amaury presented a note on the specific heat of mixtures of alcohol and water, in which they show by the examination of numerous mixtures that the specific heat of such fluids is not only higher than the mean specific heat of their constituents, but that in certain proportions it even exceeds that of water.—M. Bussy remarked that M. Buignet and himself had previously ascertained that a mixture of equivalent parts of alcohol and water had a specific heat greater than the mean of its elements.—MM. C. Martins and G. Chancel presented a second note on the physical phenomena which accompany the rupture of hollow projectiles of various calibres by the congelation of water, in reply to observations made by General Morin and MM. Dumas and Elie de Beaumont on their former communication.—A note by M. J. Violle, on the mechanical equivalent of heat, was presented by M. H. Sainte-Claire Deville.—M. A. Houzeau communicated some experiments on the electro-lisation of the air or of oxygen as a means of producing ozone. He stated that the production of ozone is greater at the negative than at the positive pole, that it increases with the electrical intensity but only to a certain extent with the duration of the experiment, that its formation is not prevented by the envelopment of the poles in glass tubes, and increases considerably with diminution of temperature, and that the ozone produced in air contains small quantities of nitrous compounds, which do not occur in that furnished by pure oxygen.—M. de Saint-Venant presented a note by M. J. Boussinesq on the theory of the flow of a liquid through an orifice in a thin wall.—The ephemeris of the newly-observed comet was communicated by M. Le Verrier from a letter of M. Winnecke's.—An extract from a letter from M. Bourgogne, giving an account of a storm which burst on the 29th of May in the neighbourhood of Alais, was communicated by M. Dumas. The hailstones were as large as small walnuts, and the damage done to the vegetation was immense.—A note on the spitting (*rochage*) of the carburets of iron, and on the sparks produced by these metals, with remarks on some new properties of iron, was read by M. H. Caron.—Some researches on platinum, by M. P. Schützenberger, were presented by M. H. Sainte-Claire Deville. This paper related to two compounds previously described by the author, namely, chloro-platinite of carbonyl, and chloro-platinite of dicarbonyl,  $\text{C O Pt Cl}_2$  and  $\text{C}_2\text{O}_2 \text{ Pt Cl}_2$ , which he stated may be regarded as the chlorides of two diatomic compound radicals, platoso-carbonyl ( $\text{C O, Pt}$ ) and platoso-dicarbonyl ( $\text{CO > Pt}$ ). He described the behaviour of these compounds when treated with ammonia and ethylene, and also the action of protochloride of phosphorus upon subchloride of platinum, and of perchloride of phosphorus upon platinum.—A long and elaborate paper on tribromhydride, by M. L. Henry, was read, and a note by M. Gobley, on the action of ammonia upon lecithine, was presented by M. A. Wurtz. He has found that lecithine in presence of ammonia gives origin to margaramide, to phosphoglyceric acid, and to choline.—M. C. Robin presented a note by MM. Lebert and Cohn, upon a new species of *Peronospora*, parasitic on cacti. The species, which the authors named *P. cactorum*, attacked several specimens of *Melocactus* and *Cereus giganteus*, in General

Jacobi's collection, and affected them with a putrefactive disease analogous to that of the potato, in which a *Peronospora* also takes part.—A note by M. E. F. Marey, "On the mechanism of the flight of birds," was communicated by M. H. Sainte-Claire Deville, to which we have adverted in another column.—A note by M. E. Perrin, presented by M. de Quatrefages, contained observations on the scissiparous reproduction of the Naidea, as evinced in the genus *Dero*.—Other papers communicated were a note by M. Yvon Villarcieu, "On the decimal division of angles and of time;" a note by M. Morache, "On the use of creosote in the treatment of typhoid fever;" one by M. Pegrani, "On the relation of the sympathetic nerve to the secretion of urine;" and one by M. Duboux, "On a new sign of death."

## BOSTON

**Natural History Society, March 16.**—The secretary read the following observations of Mr. L. Trouvelot, upon the tendency of trees to bend toward the east. In the *Scientific American*, of March 5th, 1870, is inserted a paragraph headed "The Growth of Tree Trunks." It is there stated that a French naturalist had been measuring the tree trunks in a forest, and had found them all broader in the east-west than in the north-south direction, while another arborist of Toulouse, similarly gauging the trees, found the greatest swelling of their trunks towards the east-south-east; the former attributing this want of symmetry to the rotation of the earth, while the latter thinks that it is due to the early action of the sun upon the sap. As this paragraph reminded me of some observations which I made some five or six years ago, and which bear closely upon the same subject, I will present them to the society, thinking they may have some value in a scientific as well as in a practical point of view. While in the country, if we observe attentively the tree tops, we shall soon perceive that many species seem affected by a steady wind, though there is not the least breeze to be felt. Soon we notice that the branches of a great many trees have a general tendency to obey an unknown force which bends their extremities towards the east, or perhaps more correctly, in a direction perpendicular to the magnetic meridian. This bending of small branches cannot be observed so plainly upon all kinds of trees; some species having it well marked in every instance, while other species have it less visible, and even some others not at all noticeable. Most prominent for this peculiarity is the cherry tree, sometimes bending its branches towards the east, from head to foot. Next to this come the maple, the button wood tree (*Platanus*), then the pear tree, then the oak, etc. In the last named it is not always noticeable, though if the tree is isolated from others it is very plain in every instance. With the cherry tree it is so certain, that one could almost invariably determine the cardinal points by looking at the direction of its branches. At first I thought this might be due to the action of the prevailing winds, but this hypothesis was somewhat shaken, when I saw in many instances cherry trees sheltered entirely from the west winds by high blocks of houses within a few feet of them, exhibiting the same phenomenon. Whether this direction of the branches of trees is to be attributed to the prevailing winds, or to the rotation of the earth upon its axis, or to the heat or light of the sun, or again, to terrestrial magnetism, I shall not inquire at present, not having sufficient data to establish any theory. It would be of value, I venture to say, if observers would direct attention to this subject, and see if the direction is the same all over the globe, or if it is a local phenomenon, and also ascertain what species of trees obey this unknown force. It is not only in a theoretical point of view that this observation has some value; there is in it a practical lesson for the cultivators of shade and fruit trees. Soon after my observations, it struck me that something practical could be derived from this truth. All country people know by experience—sometimes dearly bought—that the transplantation of trees does not always succeed, and especially when the transplanted trees have arrived at a certain age. Fruit growers tell us that the cherry tree is one of those least likely to live when transplanted, while the apple tree will almost invariably succeed. My observations on many thousand cherry trees have shown me that this tree is very sensitive to the unknown force, while the apple tree is a great deal less so, and it is very seldom that an indication of bending will be seen. Has not this anything to do with success in transplanting? If, without regard to the direction of the branches of a cherry tree, we set this tree in a position contrary to the one it occupied before, its branches now bending towards the west, then it is plain that the force which gave it the bend is acting in an opposite direction, in consequence of

which the tree is suffering. But with the apple tree it is different, as this is far less sensitive; therefore it will not suffer much. Ten years ago I bought a fine cherry tree and transplanted it to my garden, of course without regard to direction; the tree is now living; it has not grown a particle: there has not been one inch of new wood added to the length of its twigs since it was put there; the branches have no bend. Five years ago another cherry tree from the same place was also transplanted in my garden; the tree is now treble the size of the other, its branches are strongly bent east. Why this difference? Was the one set in a suitable position, and the other not? I could not tell. But here is something more positive. Three years ago I saw in Malden twenty beautiful pear trees transplanted with the greatest care; all these trees were of pretty good size, being some years old, and they all bent very strongly. They were set without regard to direction; five or six of these trees happened to be placed in about the position which they must have had when growing, the remainder were set in all directions. I went many times that way to watch the success of this small orchard. The very first year about one half were completely dead. The second year took five more, which had been languishing all the summer, and now five out of the twenty are living and in good condition, and strange to say, these five are those which were set with their branches dipping east. Do we owe their life to the fact that after being transplanted they occupied the same relative position with regard to the points of the compass as before, or is it only a curious coincidence? It is more than I can tell. My experience is not sufficient to allow an opinion in this matter; time will throw light upon the subject.

## DIARY

FRIDAY, JULY 1.

GEOLOGISTS' ASSOCIATION, at 8.

SUNDAY, JULY 3.

SUNDAY LECTURE SOCIETY, at 8.—On Man's Cruelty to Man: Rev. Allen D. Graham.

MONDAY, JULY 4.

ENTOMOLOGICAL SOCIETY, at 7.

LONDON INSTITUTION, at 4.—Botany: Prof. Balfour.

ROYAL INSTITUTION, at 2.—General Monthly Meeting of Members.

## BOOKS RECEIVED

ENGLISH.—Guide to the Western Alps: J. Ball (Longmans).—Treatise on the Astrolabe of Chaucer: A. E. Brae (J. R. Smith).—On the Manufacture of Beet-root Sugar: W. Crookes (Longmans).—A Glance at some of the Principles of Comparative Philology: Lord Neaves (Blackwoods).—Technological Dictionary (English-German-French), edited by E. Althaus (Williams and Norgate).—Astronomical Observations taken during the years 1865-1869 at the Private Observatory of J. G. Barclay (Williams and Norgate).—Westward by Rail: W. F. Rae (Longmans).

FOREIGN.—(Through Williams and Norgate).—Petit traité de physique; 1<sup>re</sup> fascicule: M. J. Jamin.—Bryozoi fossili Italiani; 3<sup>a</sup> Contribuzione: D. A. Manzoni.—Reactions Schema für die qualitative analyse zum Gebrauche in chemischen Laboratorium zu Berlin.—Jahresbericht über die Fortschritte der Chemie: A. Strecker.—Archiv für mikroskopische Anatomie: M. Schultze.—Vorweltliche Pflanzen aus den Steinkohlengebirge der preussischen Rheinlande und Westphalen: Dr. C. J. Andrea.—Phanologische Beobachtungen aus dem Pflanzen und Thier-reiche: Karl Fritsch.—Annales del Museo Publico de Buenos Aires: F. Savy ed Autor.

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